INFORMAL DISCUSSION OF PAPERS.

Reported by PROF. A. MCCALLA.

"FRESH-WATER SPONGES," by Henry Mills (Page 209).

Dr. Lucy.—According to Prof. Huxley, these organisms are arranged at the bottom of the Metazoa, on the ground of their embryonic development. The gentleman (Mr. Mills) has put them with the Protozoa, but has stated nothing of their life history.

Mr. Mills.—Mr. Carter, W. Saville Kent and Prof. H. James Clark, in their various works, have established their protozoic character, if I may use such a term of the sponges. The theory is fully worked out in Kent's new work on Infusoria, and clearly stated. I did not intend, in this paper, to enter upon that part of the subject.

Mr. C. M. Vorce.—Do you ever find the statoblasts free, *i. e.*, floating in the water?

Mr. Mills.—I do not.

Mr. Vorce.—Do you ever find the sponge itself in any of the early developmental stages, or are they always mature?

Mr. Mills.—In the early part of the season, say July and August, I should find the sponges small, and with but few statoblasts; as the season advances, the statoblasts become more numerous, and the tubes and cirrous appendages, of those species which have them, become more and more developed. October and the early part of November is the only time in which we can depend upon finding

sponges mature. In answer to further questions, he said the cirrous appendages or tentacles are not as shown in the drawing before you, except at maturity.

Dr. W. W. Munsen asked, How are we to tell the Sponges and the Polyzoa apart, if the sponges are to be discriminated, as proposed, only by the statoblasts and spicules, since the statoblasts of the Polyzoa are flat, and those of the sponges become so when dry?

Mr. Mills.—The two cannot be confounded or mistaken for each other, if it is borne in mind that the statoblasts of Sponges are never without silicious spicula in some form, whereas, the statoblasts of the Polyzoa are always without them, and have other peculiarities that distinguished them from sponge statoblasts. In answer to further questions as to the method of mounting, Mr. Mills said that if he wished to make sections of the statoblasts, he took a small piece of sponge containing many statoblasts, and dried it partially in bibulous paper. He afterwards imbedded it in parafine in the section-cutter, and, when perfectly cold, cut the sections, placing the cutting in hot water. The parafine then melts, setting free the sections of statoblasts, which may be prepared for mounting in balsam by the application of carbolic acid for an hour or two.

Prof. D. S. Kellicott stated some additional differences between the statoblasts of sponges and Polyzoa: That those of the Polyzoa were lenticular, chitinous brown, with a clear annulus or ring about the edge in most of our species, and that there is no opening or tube for the escape of the young; that those of the sponges were globular, of light color, and supplied with an opening or tube for the escape of the contents.

Dr. Geo. E. Fell stated, That one of the best places to find sponges was on the under side of the pieces of bark found in the water so plentifully in streams where logs are placed. On detached pieces which have laid in the water for some time it was not unusual to find patches of Spongilla from four to six inches square. Several species were often seen on the same piece of bark.

Mr. Mills said, That they should rather look for something resembling common toilet sponge, and not for a mass of jelly, as some one had directed; and that the green color was due to para-

sitic Algæ. He also said the spicules of the sponges in the Niagara River are sometimes cemented together by a kind of hard chitinous matter, which preserves the shape of the sponge. I have not determined its exact nature. It does not seem to be calcareous, and is not attacked by ordinary acids or alkalies.

"LIGHT AND ILLUMINATION," by Ernst Gundlach (Page 79).

Dr. Lester Curtis said, One point of great interest referred to in the paper is that relating to the research of Prof. Abbe and the important results he has reached in the study of diffraction and its part in illumination and microscopic vision. These studies may be familiar to many of those present, but are probably not so to all. The doctor then proceeded to give a *résumé* of Abbe's discoveries, illustrating his remarks by the blackboard.

If the eye-piece be removed when we are using a high-angled objective on a fine-lined object like *Pl. angulatum*, we shall see a central image of the flame, and also six colored spectra surrounding it. If the objective is just able to resolve *angulatum* the spectra will be violet-colored. If it be a modern high-angled glass, other spectra outside of these six will be seen, and if other colors following violet in the reversed spectra, such objectives are able to resolve more difficult tests than *angulatum*, and to do so by reason of these very spectra. In order to resolve any fine-lined or striated object, it is absolutely necessary to get these spectra, and these will be distant from the central image exactly in proportion to the fineness of the lines in the lined object, being closer to the center as the lines are coarser; farther away as the striæ are finer. When everything is favorable in the other conditions, the limit of the resolvability of an objective will be reached when the lines are so fine in the object that the outer spectra which they form are just visible at the extreme edge of the visible field of the objective. If the spectra fall beyond this, the lines cannot be resolved by that objective. But now, in this latter case, if the mirror be moved so that the light is no longer central but falls obliquely, from say the right side, the spectra will begin to appear on the other, or left side of the field of the objective, and the lines are now resolvable. So that the real